College Algebra — Joysheet 6
MAT 140, Fall 2024 — D. Ivanšić

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Covers: 2.4, 2.5 *Show all your work!*

1. (21pts) For the following functions:
a) determine algebraically whether they are odd, even, or neither
b) use the calculator to draw their graphs here and verify your conclusions by stating symmetry.

$f(x) = x^3 - 7x$

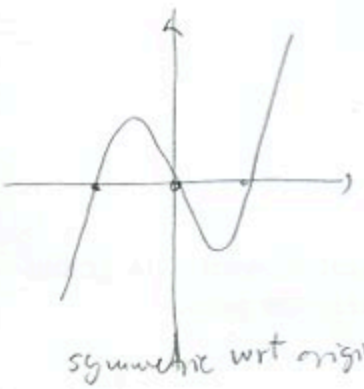
$f(-x) = (-x)^3 - 7(-x)$
$= -x^3 + 7x$
$= -(x^3 - 7x) = -f(x)$
odd function

$g(x) = x^3 - 4x^2 + 2$

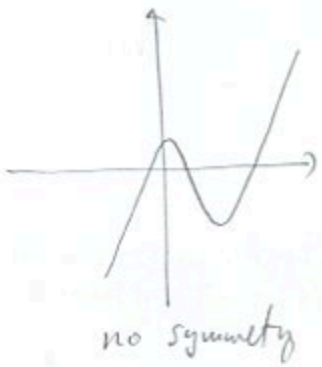
$g(-x) = (-x)^3 - 4(-x)^2 + 2$
$= -x^3 - 4x^2 + 2 \neq g(x)$
$\neq -g(x)$
neither

$h(x) = 6|x| - x^2 + 3$

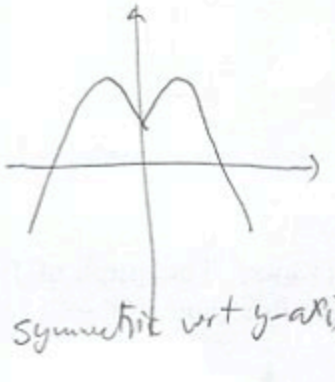
$h(-x) = 6|-x| - (-x)^2 + 3$
$= 6|x| - x^2 + 3 = h(x)$
even function



symmetric wrt origin

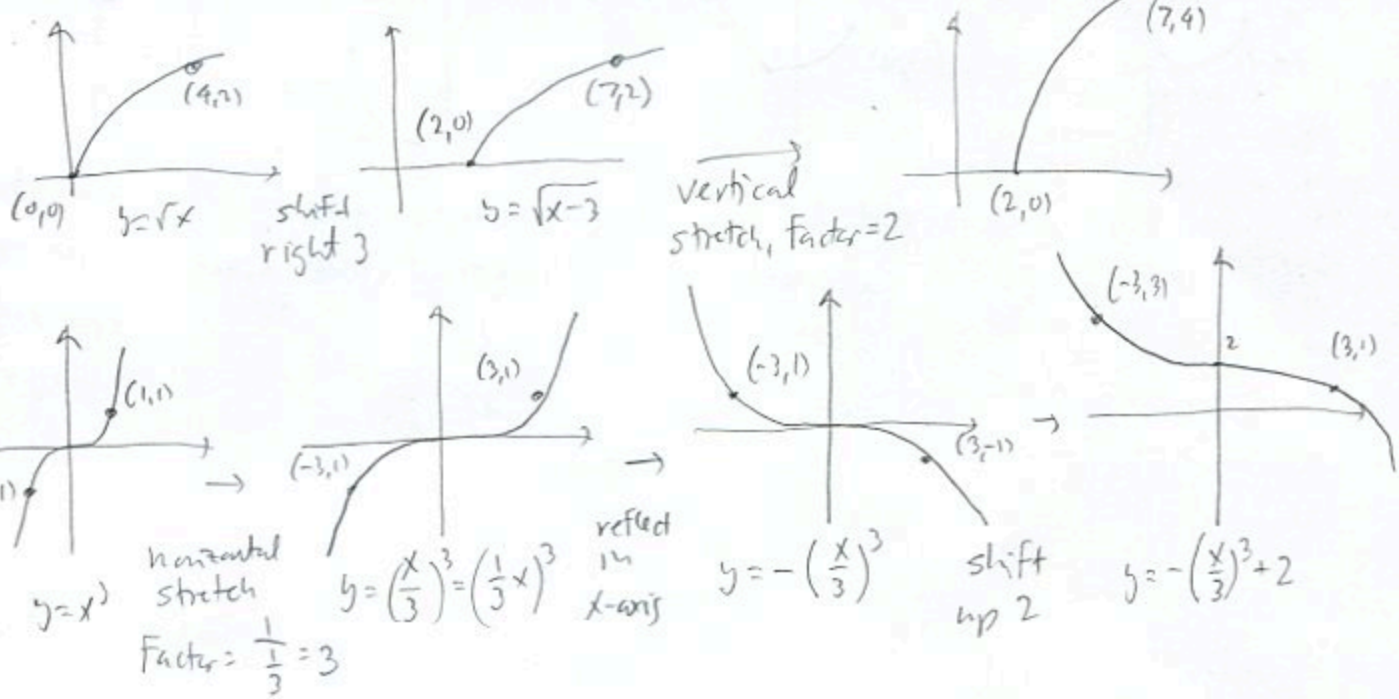


no symmetry



symmetric wrt y-axis

2. (16pts) Draw the graphs of $f(x) = 2\sqrt{x-3}$ and $g(x) = -\left(\frac{x}{3}\right)^3 + 2$ using transformations. Explain how you transform graphs of basic functions in order to get the graphs of f and g. Indicate at least two points on each graph.



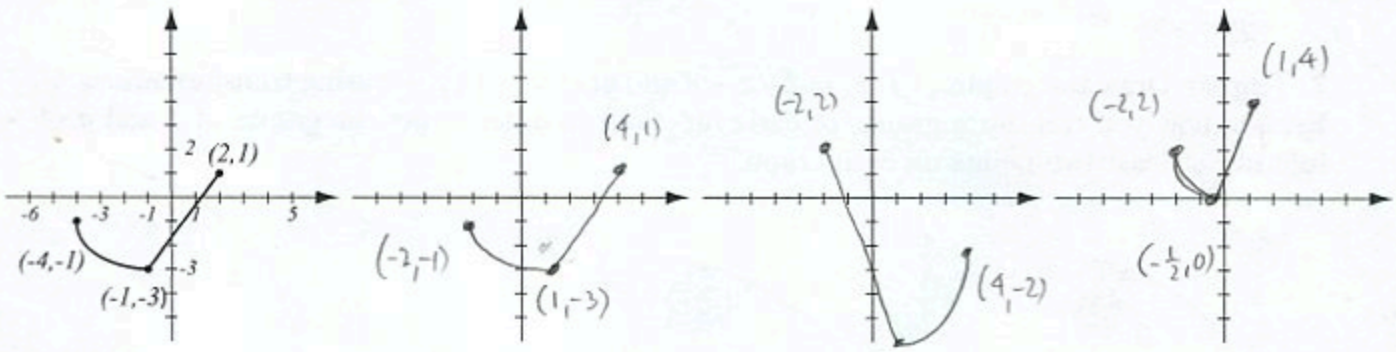
3. (10pts) Write the equation for the function whose graph has the following characteristics:
a) shape of $y = x^2$, shifted down 3 units,
b) shape of $y = \frac{1}{x}$, reflected about the y-axis, then shifted right 7
c) shape of $y = |x|$, reflected about the x-axis, then stretched vertically by factor 2, then shifted left 4 units.

a) $x^2 \rightsquigarrow x^2 - 3$ $\qquad y = x^2 - 3$

b) $\frac{1}{x} \rightsquigarrow \frac{1}{-x} = -\frac{1}{x} \rightsquigarrow -\frac{1}{x-7}$ $\qquad y = -\frac{1}{x-7}$

c) $|x| \rightsquigarrow -|x| \rightsquigarrow 2(-|x|) = -2|x| \rightsquigarrow -2|x+4|$ $\qquad y = -2|x+4|$

4. (13pts) The graph of $f(x)$ is drawn below. On three separate graphs, sketch the graphs of the functions $f(x-2)$, $2f(-x)$ and $f(2x)+3$ and label all the relevant points.



shift right 2

$x \mapsto x+2$

$y \mapsto y$

reflect in y-axis

vertical stretch, factor?

$x \mapsto -x$

$y \mapsto 2y$

horiz stretch, factor $\frac{1}{2}$

shift up 3

$x \mapsto x \cdot \frac{1}{2}$

$y \mapsto y+3$